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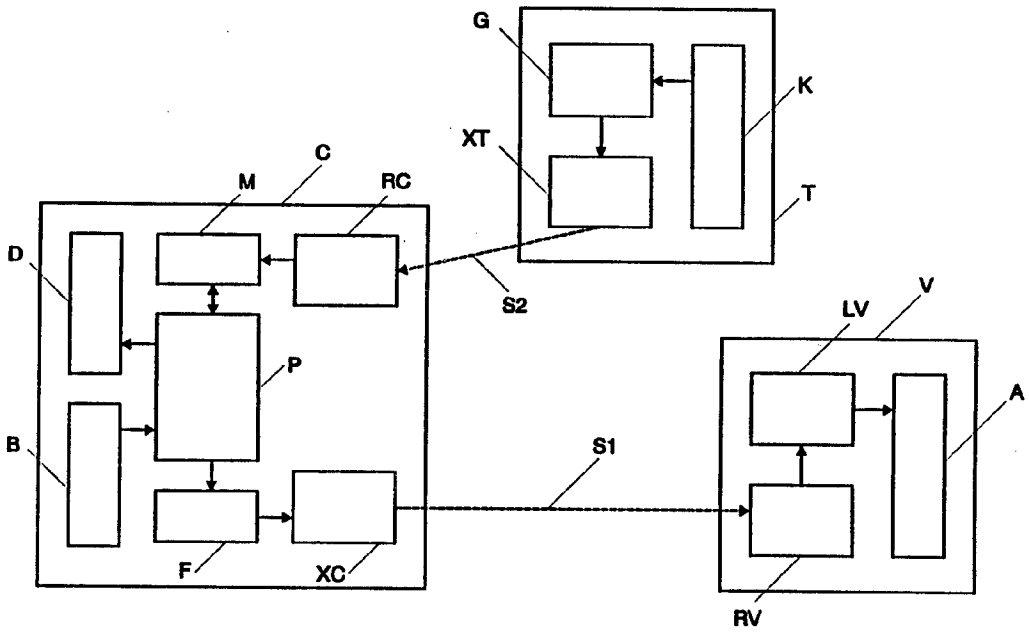

(57) Abstract

The invention relates to a remote control system for e.g. controlling lighting. In the system according to the invention transmitter devices are placed to operation areas, and the transmitter devices transmit a signal to the controller device, and the signal includes information about the surroundment. Using this information the controller is adapted to the surroundment and by activating the control means of the controller it is easily possible to control the receiver devices and the functional devices which exist in the surroundment or which affect the conditions of the surroundment.

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REMOTE CONTROL SYSTEM

The object of the present invention is a remote control system for remote control of e.g. lighting, air-conditioning, safety devices, and audiovisual devices.

Remote control systems have been commonly used e.g. in the field of entertainment electronics. Formerly these systems were based on the utilization of ultrasound (US), but presently technology based on infrared light (IR) is more commonly used. Drawbacks related to the use of ultrasound were e.g. rather restricted use of control and address codes. IR-systems applicable for lighting control are manufactured by e.g. Siemens A.G., Germany and Philips, Holland. The drawback related to the IR-method is the requested optical path between the transmitter and the receiver. This restricts the positioning of functional devices, and a more comprehensive control system requires installation of a control line network between functional devices and IR-receivers. Thus radio control systems are expected to gain increasing shares in the control of lighting and air-conditioning equipment, as well as audiovisual and safety devices, as the positioning of transmitters or functional devices does not restrict control functions nor is control cabling necessary. Utilizing radio frequencies even large amounts of functional devices can be controlled by adding an address code to the control signal, the number of selectable address codes being sufficient considering the number of functional devices to be controlled.

If, however, it is desirable to control all devices of a large system with the same controller, the control means of the controller become complicated and difficult to use, and the manufacturing costs of the controller increase. In practise, however, also in large systems controlling of only a restricted amount of the functional devices of the system generally is desired, i.e. the functional devices which influence the immediate surrounding of the

controller.

In office buildings, e.g., only controlling of the lighting, air-conditioning etc. of the room where the user of the controller is situated usually is desirable. However, the same controller should also be effective in all rooms, in order for e.g. cleaning and service personnel to be able to control the lighting with a single controller regardless of where tey are working.

E.g. the lighting control of a single office or hotel room should be performed with a controller comprising simple and only the necessary push-buttons for controlling the lighting of the room. Implementation with radio control however means that all lighting equipment of the rooms are requested to have their own address codes, in order not to enable the controlling of some other room lighting from a specific room.

In solutions known from prior art a control system for large facilities requests complicated user interface controllers, or if controllers with simple user interfaces are utilized, they are not interchangeable nor is such a controller applicable as master controller for cleaning or service personnel, as a separate controller would be needed for each room. Further the implementation of a controller or the exchange of a faulty controller requires coding of the controller before usage.

The implementation of the present invention substantially eliminates the above disclosed drawbacks. A remote control system according to the present invention is characterized by the disclosure of the characterizing portion of Claim 1.

In a system according to the invention such transmitter devices are located in the various facilities of the building, e.g. in the rooms, that transmit location information to the controllers situated in the same room. Thus the

controllers are informed about their location, and upon activation of its control means the controller can, based on e.g. a location address map stored within it, automatically select the address codes of the receiver devices affecting the conditions of that room.

The solution of the present invention enables low-cost implementation of a control system, which enables use of the same controller in all rooms of a building, e.g. in office facilities or in hotels. The user interface of the controller, however, can be quite uncomplicated according to the solution of the present ivention.

The system combines e.g. the versatile coding and control possibilities of radio control with the restricted operation area of e.g. infrared light or ultrasound. Thus the controller can be carried e.g. from one room to another and the control will affect the receivers and functional devices which influence the conditions of the room where the control actions are performed. An optical path is not requested between the controller and the receiver device, and when desirable, also e.g. the lighting of a whole floor can be controlled without installation of control lines. The system is extremely well suited for e.g. hotels, conference facilities, nursing institutions, and apartments.

In the following a solution in principle of a remote control system according to the present invention is described with reference to Fig. 1.

The references of Fig. 1:

C	Controller
B	Control means of the controller
D	Display means of the controller
P	Processor and logic unit of the controller
F	Coder of the controller

XC	Transmitter means of the controller
RC	Receiver and display means of the controller for the location information signal
M	Memory of the controller
V	Receiver device
RV	Receiver and display means of the receiver device
LV	Logic unit of the receiver unit
A	Functional device
T	Location information transmitter
K	Coding means of the location information transmitter
G	Coder or modulator of the location information transmitter
XT	Transmitter means of the location information transmitter
S1	Control signal
S2	Location information signal

In the exemplary system the transmitter means XC of the controller C transmit the control signal S1, which is transmitted as a radio frequency signal with a frequency of e.g. 433,92 MHz. A control statement is coded into the control signal, being for instance turning on the functional device A of the receiver V.

When the controller means B of the controller C are activated, the processor or logic unit P of the controller generates address and control codes. From these codes the coder F generates a signal for the control of the transmitter means XC, which transmit the control signal S1.

The receiver device comprises receiver means RV for receiving and detection of the control signal. The logic unit LV detects the the code contained in the control signal, and if the control statement is directed to the receiver de-

vice, the logic unit controls the functional device A in accordance with the control statement e.g. to assume the active state.

The transmitter device T transmits the location information signal S2 to the controllers, which are situated in the same room as the transmitter device T. The location information signal is received by the controller C and it is detected by the receiver means RC. The information included in the location information signal is stored in memory M. A location address map is also stored in memory M or in another similar memory, containing the addresses of the receiver devices located in the various rooms or regulating the conditions of the rooms. As the controller means B of the controller are activated, the processor or logic unit P of the controller defines the address code of the control signal based on the control means which have been activated as well as on the location information and the location address map. This control statement code defined by the address code and the activated controller means is included in the control signal S1. Thus the receiver devices influencing the conditions of exactly the same room can be readily controlled through activation of the control means.

The system enables selection of the transmission of the control signal S1 in such a way that the control when desirable can be performed through walls, or e.g. can the lighting of a whole building or floor be controlled with a single control signal. Thus the system is espescially well suited for utilizing e.g. radio control.

The control signal S1 can be constituted by a carrier, which has been amplitude, frequency, or phase modulated utilizing the relevant control information, which can comprise e.g. the address code of the receiver device and the control statement code. The system according to the invention does not restrict the generating and transmission

method for the control signal.

The location information signal preferrably can be transmitted utilizing e.g. infrared light or ultrasound as transmission method, readily enabling location of the transmitters in such a way that the controller will not receive location information signals from transmitters situated in adjacent rooms.

The transmission method for the location information signal ST can be selected so that it optimally fulfills e.g. the operation distance and space restriction requirements of the control. Advantageous transmission methods are e.g. infrared light and ultrasound, as they do not penetrate conventional walls. Ultrasound can be utilized for instance in office facilities with glass walls. Infrared light can be utilized e.g. in landscaped offices and in facilities including many door-openings, as infrared light can be better focused and are not reflected by conventional walls.

Detection information can be included in the location information signal for instance as amplitude modulation of a certain frequency, so that both the modulator of the transmitter device and the detector of the controller can be of uncomplicated construction. If more extensive location information is necessary, a location code, e.g., can be modulated on the location information signal.

In a system according to the present invention the energy consumption of the transmitter device can be minimized by sending the location information signal as repeated pulses. An alternative solution for decreasing the energy consumption is to switch on the circuitry which receives the location information signal for the controller only when the controller means are activated. In this case it is necessary that the transmitter continually transmits the location information signal, or that the signal sent by the controller activates the transmitter to transmit the

location information signal. Thus the delay between activation of the controller means and reception of the location information signal does not become excessive. In the following such a solution in principle is described with reference to Fig. 2.

The references of Fig. 2 are identical with the references of Fig. 1 with the following additions:

S3	Enquiry signal
RT	Receiving means of the transmitter device
LT	Logic unit of the transmitter device

When the controller means are activated the processor or logic unit P of the controller checks if a predetermined time period after reception of the preceding location information signal has elapsed. If this time period has elapsed, the controller sends an enquiry signal S3 to the transmitter device T. The transmitter device T receives and detects the enquiry signal with its receiver means RT, through which the signal is connected to the logic unit LT of the transmitter device. The logic unit detects the signal and activates the transmitter means XT and the coder unit G to send the location information signal to the controller. The receiver means RC of the controller receive and detect the location information signal and supply the location information to the memory of the controller. If sending of a control signal is necessary for the activation of the control means, it is sent according to the disclosure of the first exemplary solution. In all other respects the second exemplary solution functions identically with the first exemplary solution.

Utilizing the enquiry signal both the controller and the transmitter device can be in a state of reduced power consumption when the controller is not used. Further it is possible to connect a processor voltage to the controller in its standby state, so that the processor with predeter-

mined intervals activates the means necessary for sending the enquiry signal and for receiving the information of the location information signal in order to obtain new location information. Thus the memory of the controller continuously contains the new location information and no time is lost sending an enquiry signal and receiving the location information signal in connection with activation of the control means.

The enquiry signal can preferrably be transmitted to the transmitter device utilizing the same transmission method as for the control signal, e.g. radio frequencies, so that the same transmitter means of the controller can be used for transmitting both signals. It is, however, also possible to utilize the same transmission method as for the location information signal, e.g. ultrasound or infrared light.

When the controller is removed from a room where a transmitter device is located, it is often advantageous for the controller not to be able to control the receiver devices affecting the conditions of that room anymore, in spite of the controller not having received a new location code. This can be implemented by preventing the controller from utilizing the location code stored in the memory or by making it remove the stored location code from its memory, unless it does not receive a location code within a predetermined time period.

The memory containing the location map of the controller can be an electronic memory or a map constituted by e.g. cabling and switches. The map can be permanent or changeable.

The transmitter can be a device connectable to e.g. a mains outlet or a lighting socket, or a device for fixed ceiling or wall installation. It can also be integrated in the receiver device.

Above only some implementations and alternative embodiments according to the present invention have been described. However, this in no way is intended to restrict the invention only to cover the mentioned implementations and embodiments, but numerous modifications are possible included in the scope of the appended claims.

CLAIMS:

1. A remote control system for the control of e.g. lighting, air-conditioning or safety devices, wherein upon activation of control means of a controller, the control means possibly comprising display means, the controller transmits a first signal, in the following called "the control signal", to a receiver device utilizing as transmission method electromagnetic fields such as radio waves, acoustic or light waves, electrical conduction or inductive or capacitive coupling, into which utilizing known modulating techniques has been coded desired information, e.g. a control statement which may include an address code specific for each receiver device, and the reception of the control statement causes activation of a functional device being part of or connected to the receiver device, c h a r a c t e r i z e d in that the system comprises at least one transmitter device, the transmitter means of which are arranged to transmit to the controller, utilizing some of the above mentioned transmission methods, another signal, in the following called "the location information signal", so that the location information signal includes information about the room or surrounding where the control device is situated, and the controller comprises means for the receiving of this location information signal.

2. A remote control system according to Claim 1, c h a r a c t e r i z e d in that the address code or corresponding information contained in the control signal transmitted upon activation of the control means of the controller is arranged to be a function of the location information signal received by the controller.

3. A remote control system according to Claim 1 or 2, c h a r a c t e r i z e d in that the controller comprises memory means for storing the information contained in the location information signal.

4. A remote control system according to any of the preceding Claims, c h a r a c t e r i z e d in that the controller comprises memory means which contain a map including address codes corresponding to various location information.

5. A remote control system according to any of the preceding Claims, c h a r a c t e r i z e d in that the control signal is transmitted as an electromagnetic field, such as radio waves, and the location information signal is transmitted as light waves, e.g. as infrared waves.

6. A remote control system according to any of the Claims 1 - 4, c h a r a c t e r i z e d in that the control signal is transmitted as an electromagnetic field, such as radio waves, and the location information signal is transmitted as sound, e.g. as ultrasound.

7. A remote control system according to any of the preceding Claims, c h a r a c t e r i z e d in that the location information signal is transmitted as repeated pulses.

8. A remote control system according to any of the preceding Claims, c h a r a c t e r i z e d in that when the controller does not receive a location information signal within a predetermined time period, the location code in the memory changes automatically or the controller does not utilize the location code stored in the memory until the next location information signal has been received.

9. A remote control system according to any of the preceding Claims, c h a r a c t e r i z e d in that the information contained in the location information signal received by the controller affects the information displayed by the display means related to the controller.

10. A remote control system according to any of the pre-

ceding Claims, c h a r a c t e r i z e d in that the means which receive the location information signal for the controller become activated upon the activation of the control means.

11. A remote control system according to any of the preceding Claims, c h a r a c t e r i z e d in that the means which receive the location information signal for the controller become activated when a predetermined time delay has elapsed after the receiving of the preceding location information signal.

12. A remote control system according to any of the preceding Claims, c h a r a c t e r i z e d in that the transmitter device comprises means for receiving the signal sent by the controller, and the receiving of the signal sent by the controller activates the transmitter device to tarnsmit the location information signal to the controller.

13. A remote control system according to Claim 12, c h a r a c t e r i z e d in that the controller transmits an "enquiry signal" to the transmitter device to initiate receiving of the location information signal.

14. A remote control system according to Claim 13, c h a r a c t e r i z e d in that the controller transmits an enquiry signal upon activation of the control means.

15. A remote control system according to Claim 13 or 14, c h a r a c t e r i z e d in that the controller transmits an enquiry signal when a predetermined time delay has elapsed after the receiving of the preceding location information signal.

16. A remote control system according to any of the Claims 13 - 15, c h a r a c t e r i z e d in that the transmission method for the enquiry signal is the same as the transmission method for the control signal, e.g. radio

waves.

17. A remote control system according to any of the Claims 13 - 15, c h a r a c t e r i z e d in that the transmission method for the enquiry signal is the same as the transmission method for the location information signal, e.g. ultrasound waves or infrared waves.

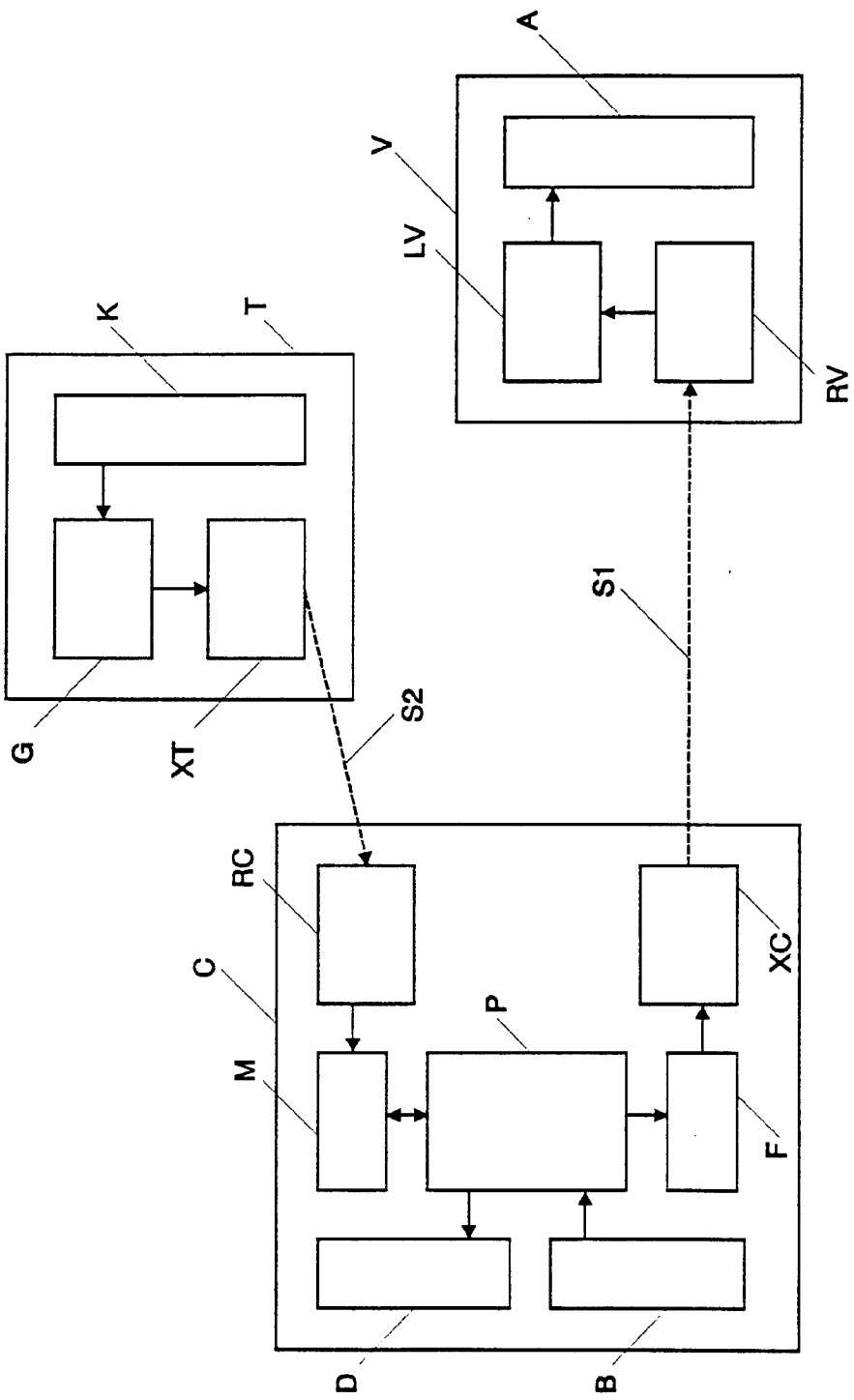

FIG. 1

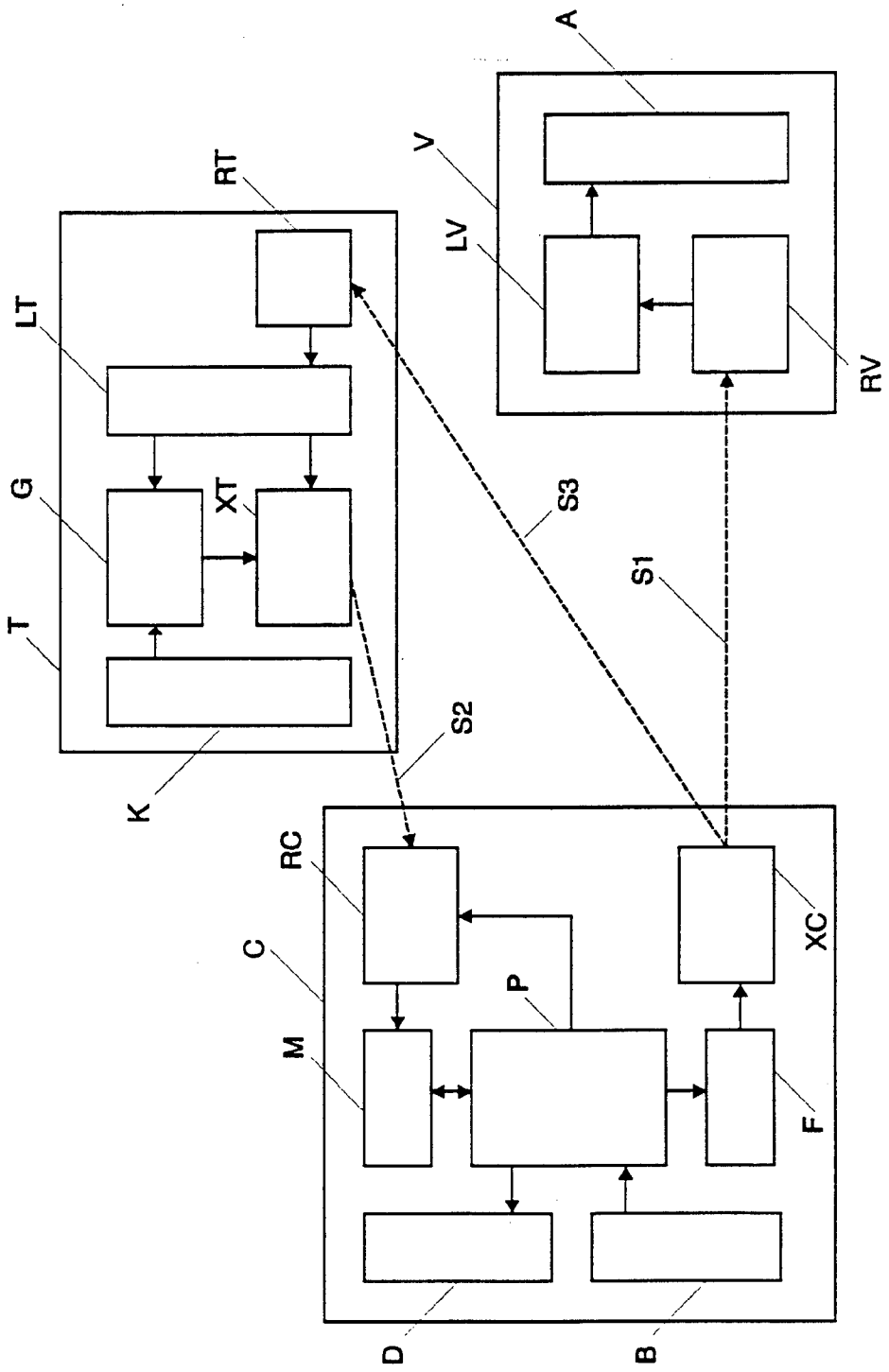

FIG. 2

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 93/00339

A. CLASSIFICATION OF SUBJECT MATTER

IPC5: G08C 19/00, G08C 17/00, H04Q 9/00
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC5: G08C, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

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C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US, A, 4347501 (D. AKERBERG), 31 August 1982 (31.08.82), abstract	1-12
Y		13-17
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X	US, A, 4296408 (J. K. NEURINGER), 20 October 1981 (20.10.81), abstract	1-12
Y		13-17
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Y	US, A, 5126733 (R. C. SAGERS ET AL), 30 June 1992 (30.06.92), abstract	13-17
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[X] Further documents are listed in the continuation of Box C. [X] See patent family annex.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

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INTERNATIONAL SEARCH REPORT

Information on patent family members

01/10/93

International application No.
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